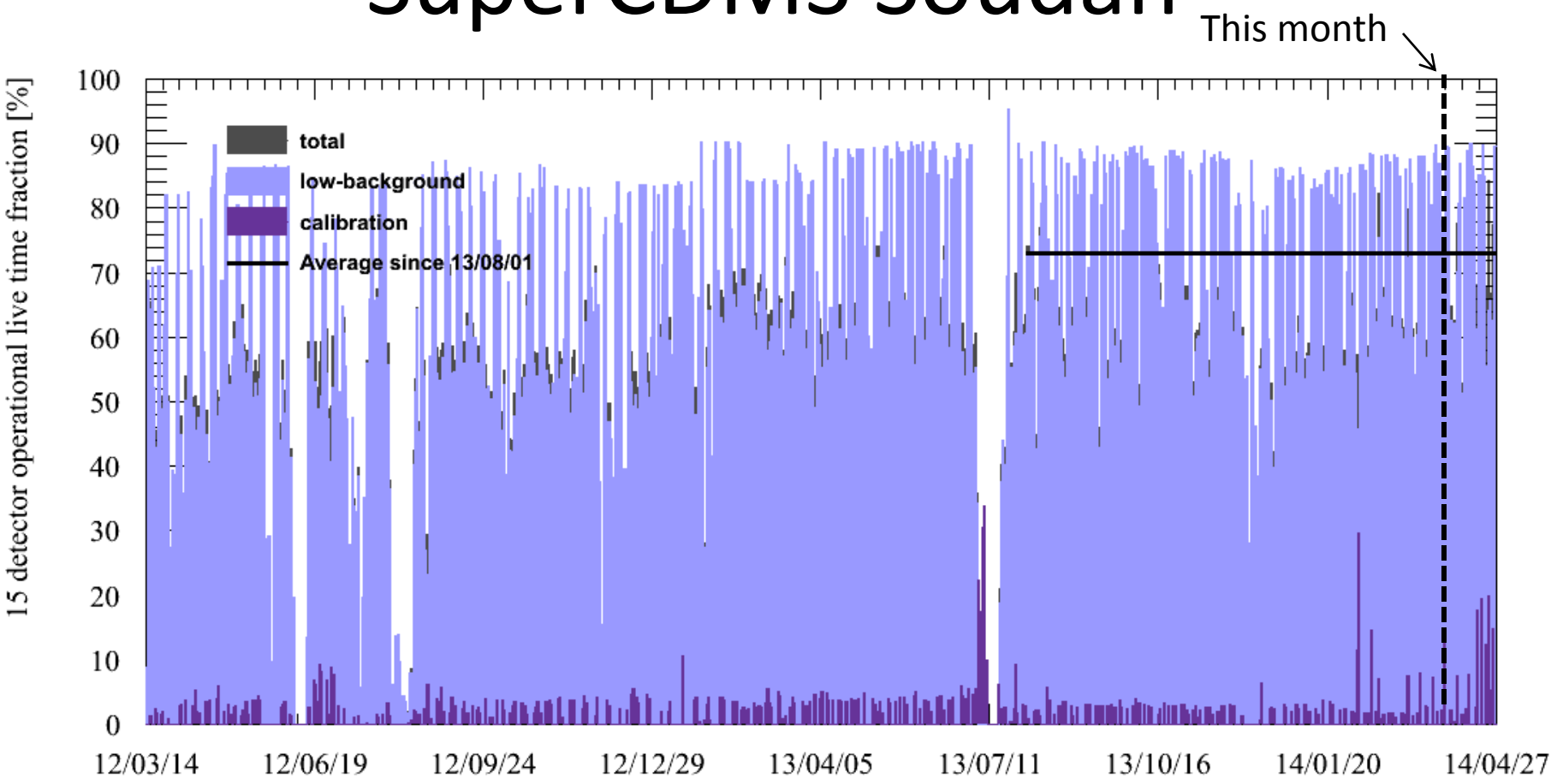
Cosmic Frontier Experiment Status

April 28, 2014

Experiment	Location	Status	Start of operations	Nominal end of operations	Physics
SuperCDMS	Soudan	Operating	Mar 2012	Mar 2015?	Dark Matter
COUPP/PICO 2L	SNOLAB	Operating	Dec 2013	Dec 2014?	Dark Matter
COUPP/PICO 60	SNOLAB	Operating	June 2013	Dec 2015?	Dark Matter
Darkside 50	LNGS (Gran Sasso)	Operating/ Calibrating	Jan 2014	Dec 2016?	Dark Matter
DAMIC	SNOLAB	Operating	Dec 2012	Dec 2015	Dark Matter
Dark Energy Survey	CTIO, Chile	Operating/ Off-season	Sep 2013	Feb 2018	Dark Energy
Pierre Auger	Argentina	Operating	2008	2015 (for FNAL)?	High Energy Cosmic Rays
Holometer	Meson Lab	Commissioning	Spring 2014	2015	Spacetime

SuperCDMS Soudan

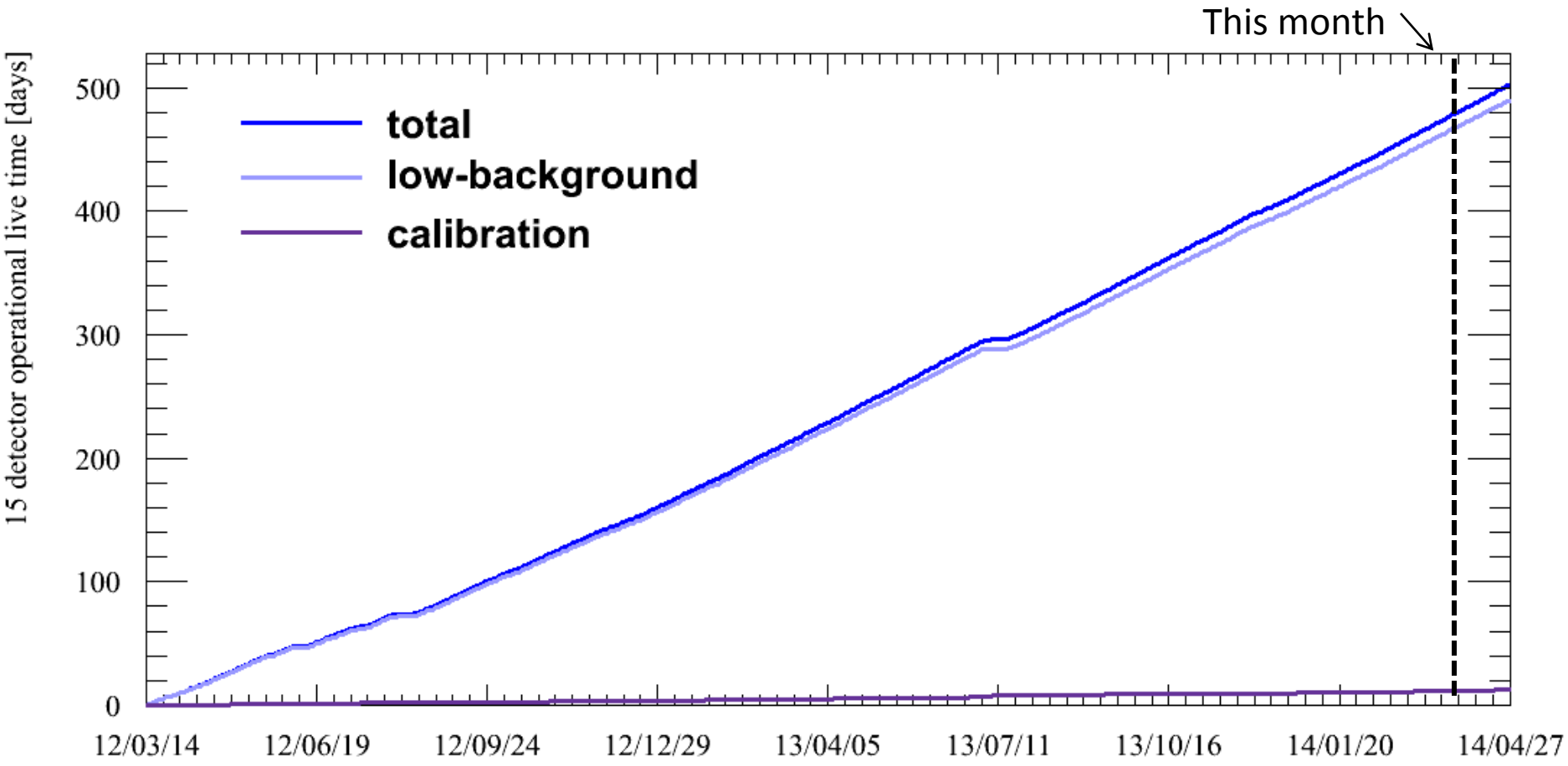


Contributions to the dead-time include:

- 10% due to calibration with gamma and neutron sources
- 10% to maintain detector charge collection
- 5-8% for maintenance and special data sets

Full recovery of all cryogens with reliquefiers minimizes cryo deadtime

SuperCDMS Soudan



Integrated live time (days) since beginning of operations

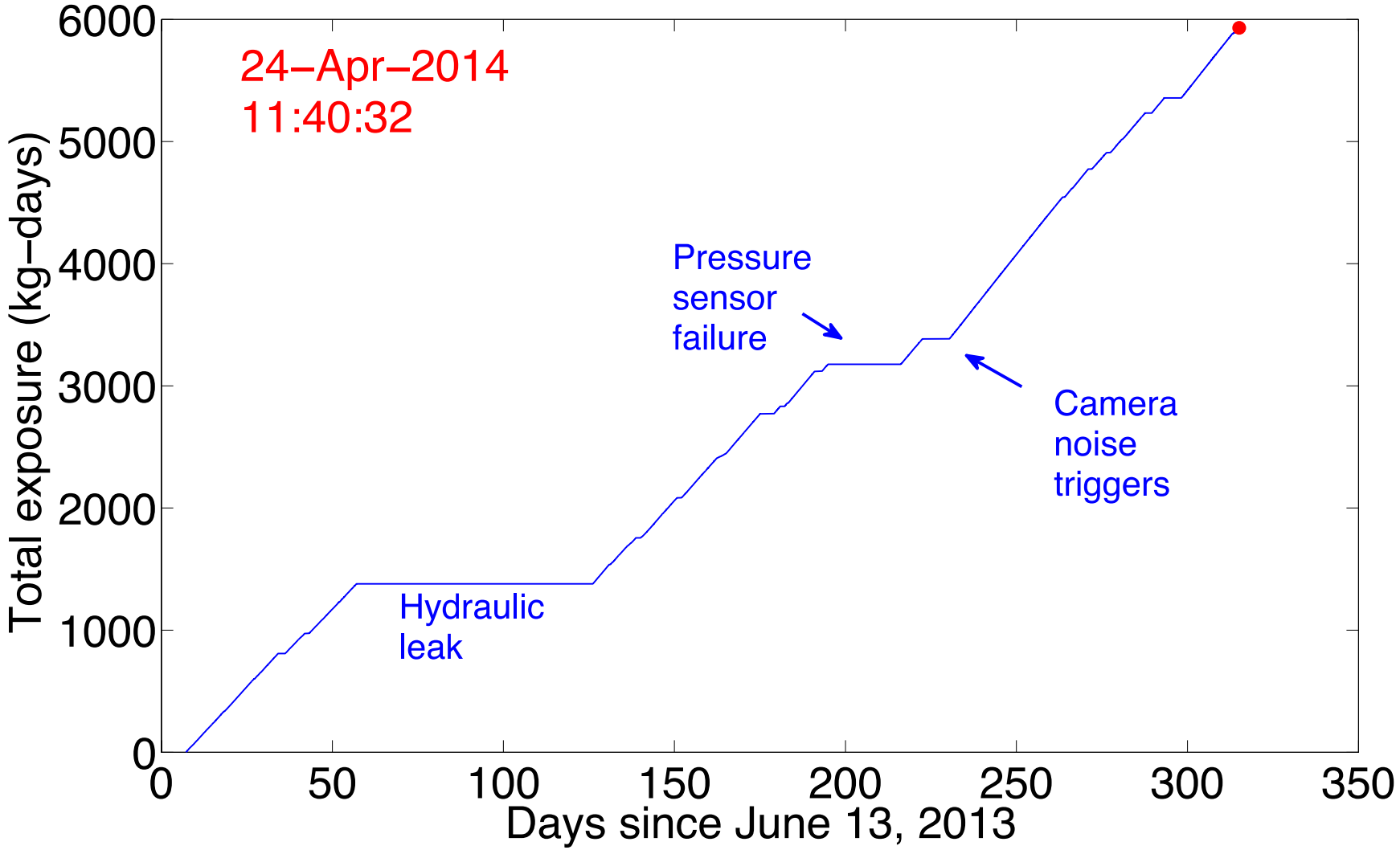
Detector mass is approximately 9 kg Ge, so WIMP exposure =11.6 kg-years

COUPP/PICO Operations Summary

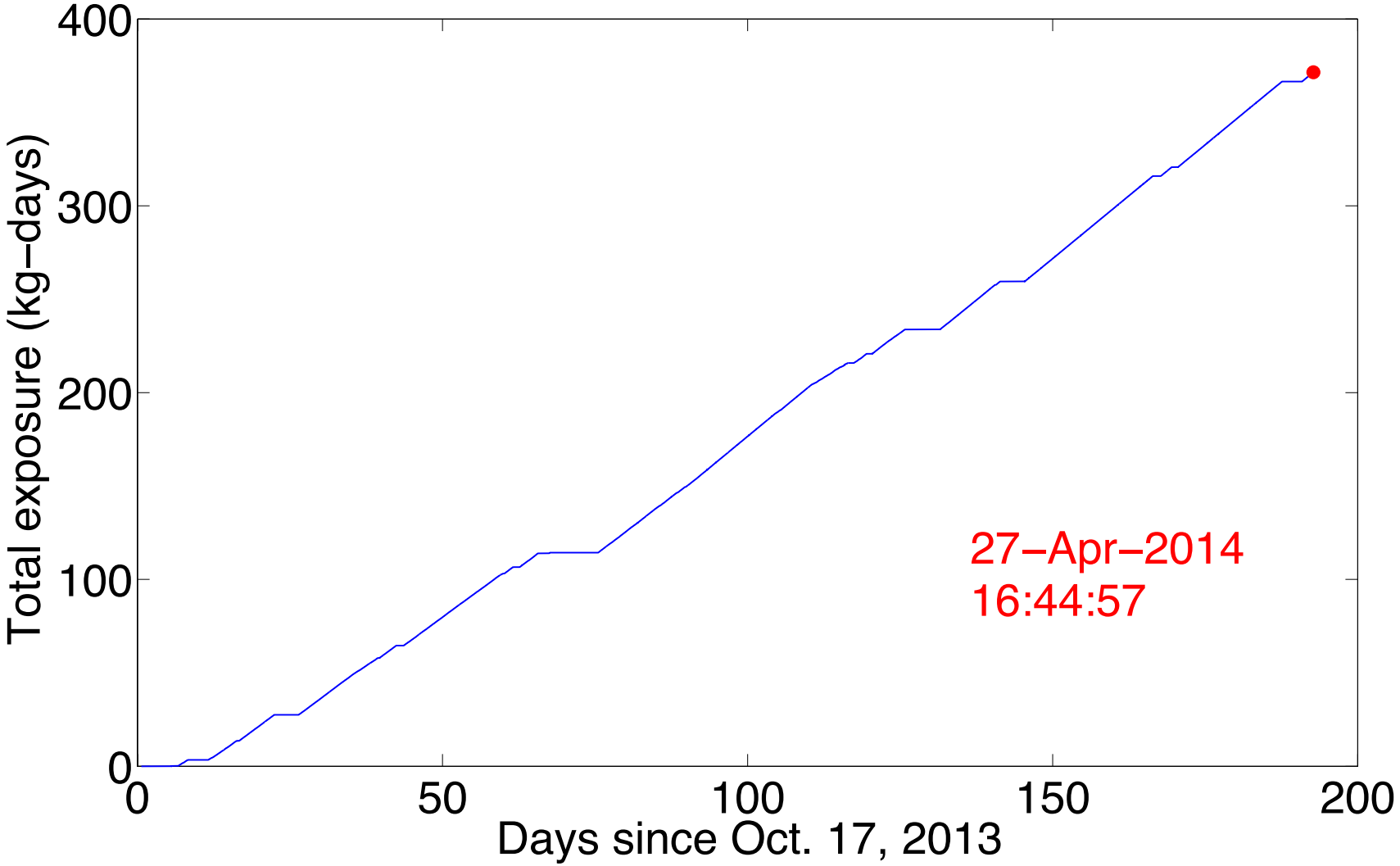
COUPP-60 and PICO-2L runs are both operating well

- End of run for both chambers planned for May 15 to allow for upgrades and sampling of internal fluids
- In the last few weeks, aim is to collect large calibration data set in COUPP60 (neutron source running every few days)
- PICO-2L continuing dark matter search data until end of run

COUPP-60 Exposure Vs. Time



PICO-2L Exposure Vs. Time



Holometer (E-990) Commissioning Status:

- **Achieved consistent, stable interferometer operation with 1 kW beams.**
  - Degradation of mechanical damping system for optics was found to be due to stiffening of viton rubber dampers due to cold temperatures
    → Solved by heating the system to 35C with temperature control loop.
  - Beam instabilities due to angular seismic motions have been discovered and mitigated by removing poorly-mounted ion pumps.
  - Current effort is on further stabilizing the beam to reduce the interference fringe power from 400 mW → 200 mW, the maximum the photodetectors can eat.
    - Excess signal power must unfortunately be thrown away…

- **Two interferometer cross-correlation data taken for ½ hour**
  - Current sensitivity is ~10^{-19} meters/rtHz, a factor of 30 below shot noise
  - Already lots of interesting effects to analyze

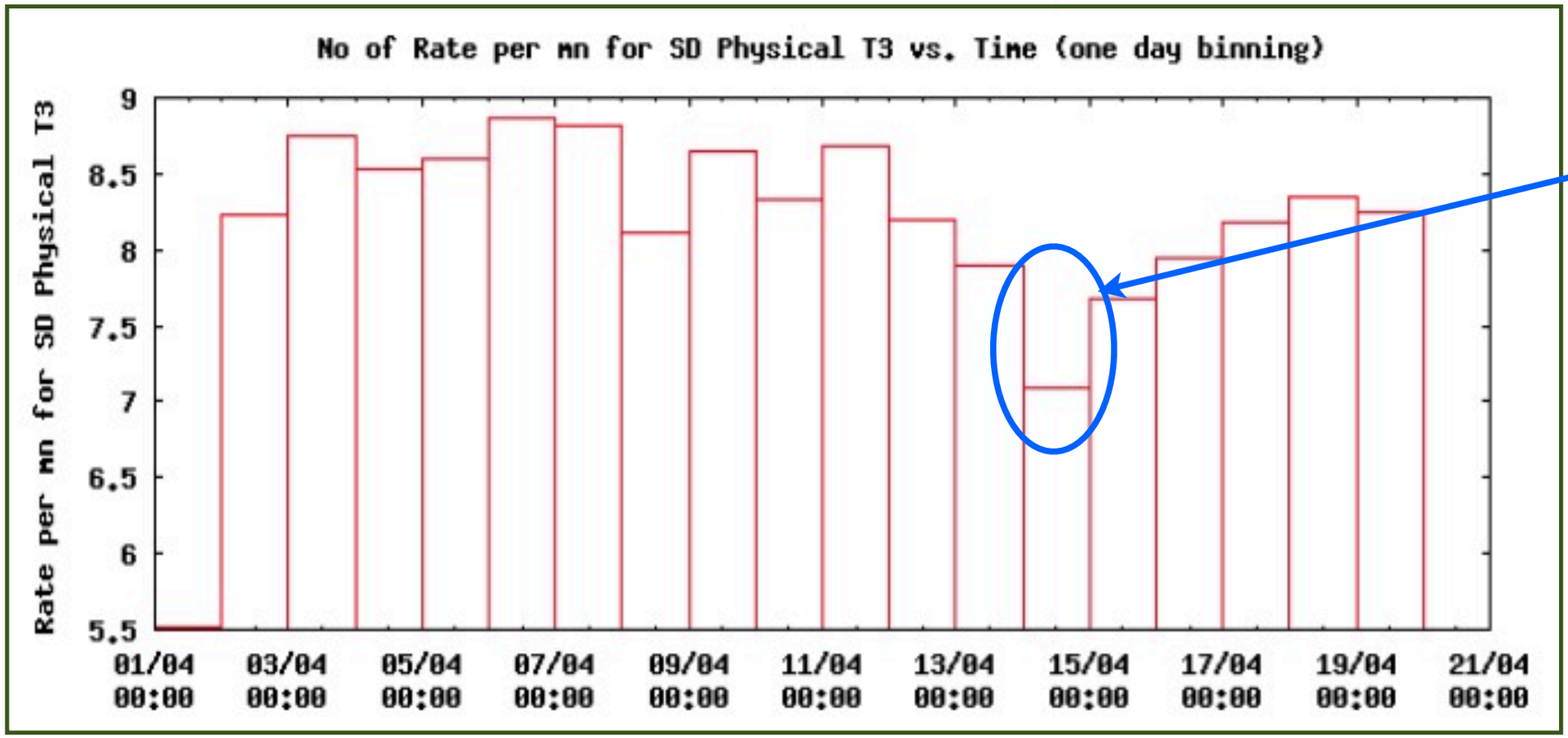
- **Interferometer power pushed to 2.1 kW for short periods.**
  - Previous best was 1.6 kW
  - Sensitivity to Planck-suppressed holographic noise improves as 1/Power^2

Pierre Auger Observatory

Activities between April 1 - 20

- SD efficiency: 91% efficiency in the past two weeks, on-going maintenance, upgrade R&D activity (involves SD) in the field.
- Recent FD observation period: - March 23 - April 9; no error, smooth running, high wind and rain on some days.
  - current shift is running; April 20 - May 9.
- Radio array (AERA) is running: able to detect air showers in coincidence with SD/FD.

✤ April 1 - 20: Number of triggers from cosmic rays ($E > 10^{18}$ eV) per minute ~ 12000 / day



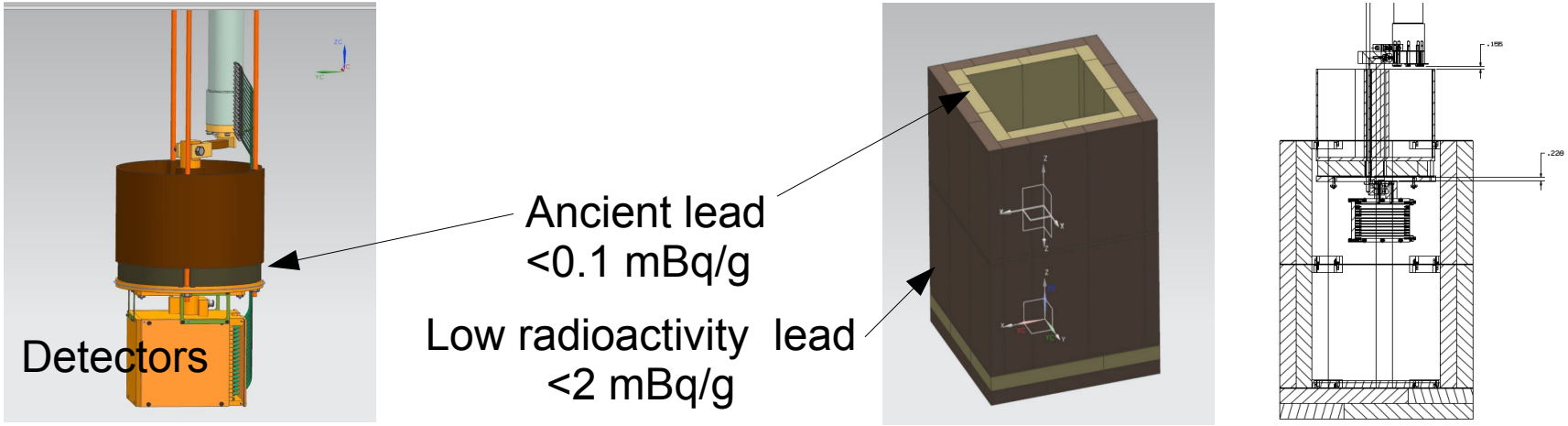
DAMIC – Dark matter with CCDs

(FNAL, UChicago, UMich, Mexico, Argentina, Paraguay, Zurich)

March – April 2014

- Taking data with prototype detectors. Uptime >95%. High quality data.

- Current setup dominated by 210Pb. Preparing shield upgrade to include 1'' of ancient lead and 1'' of low radioactivity commercial lead (order placed by Zurich collaborators).

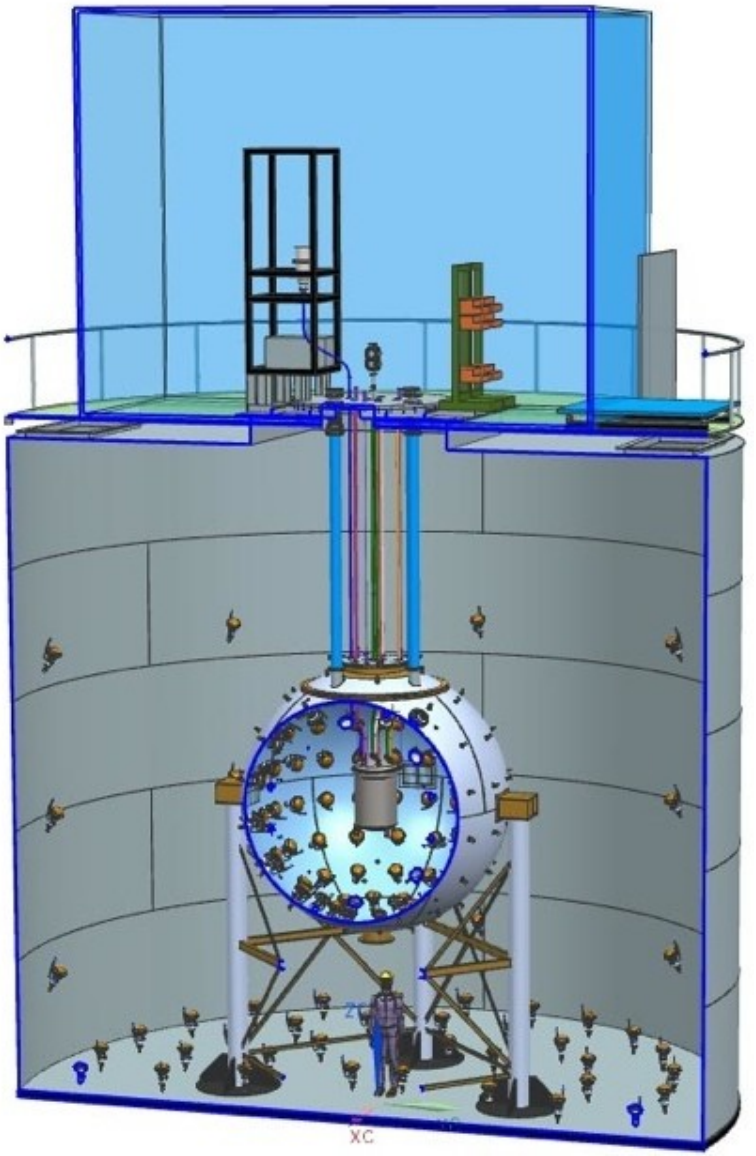


Spring - Summer 2014

- DAMIC-100: detectors fabrication completed by DALSA. Will start packaging them soon (May-June).
- If prototype packages demonstrate success -> 100g detector in operation during 2014 to probe CoGent/CDMS region... and even lower DM masses

DarkSide-50 Status

- **Detectors Operating**
- **TPC**
  - **Running with Atmospheric Ar**
  - **Demonstration of 39Ar rejection (278 kg - day, equivalent to 2.6yr UAr DS-50) DONE**
  - **Collecting high statistics to prove 39Ar rejection for DS-G2.**
    - **Several fixes to the DAQ are making data taking smooth and >95% live.**
    - **Acquiring at 40 kg- day/day**
- **Neutron Veto**
  - **Observed a high 14C rate due to TMB**
  - **Separation of PC from TMB and replacement with low 14C TMB started on April 1st. Scheduled to be finished by June 1st.**

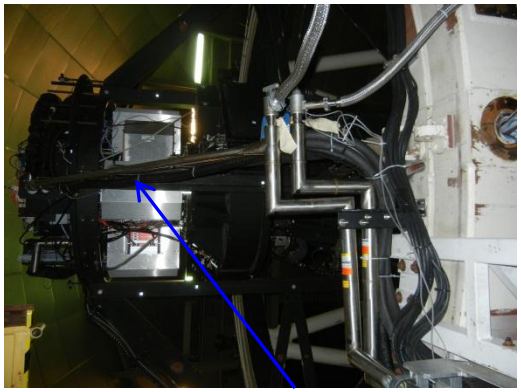


Dark Energy Survey

DARK ENERGY SURVEY

- August 30, 2013 < Season 1 < February 10, 2014
- Now DECam is being used by other experiments/projects until DES restarts in mid-August 2014.
- Meanwhile, DES is
  - Working on completion of science publications. Getting close for 1st submission, a tight race between several analyses
  - On April 11th Year 1 preliminary data catalog “Y1P1” released, 240 sq-deg
  - Checking DESDM software for “Y1A1”, to be released after start of Y2 in August ~1000 sq. deg.

- May 12-18, 2014 Engineering Work Trip for FNAL team
  - After 7m operation, replace LN2 pump that cools CCDs to -100C with a refurbished pump
  - Remove frozen H_2O from two LN2 transfer pipe vacuum-jacket segments, train CTIO staff



Bad vacuum in these lines